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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/916,629	08/22/1997	CHAD A. COBBLEY	97-0098	3496

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EXAMINER

AFTERGUT, JEFF H

ART UNIT	PAPER NUMBER
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1733

DATE MAILED: 12/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

08/916,629

Applicant(s)

COBBLEY ET AL.



Examiner

Jeff H. Aftergut

Art Unit

1733

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 October 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 and 40-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 and 40-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>10-29-04</u> . | 6) <input type="checkbox"/> Other: _____ |

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-11, 13, 16, 21, 22, 40-44 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In each of the identified independent claims as well as in dependent claims 13 and 16, the applicant has recited a range for the thickness of the adhesive material following polymerization as being between 0.2 to 2.0 mils in thickness. While applicant has examples of a thickness of 0.2 mils in thickness for the polymerized adhesive (see examples 1 and 2, the only disclosed range provided in the specification for the thickness of the adhesive layer was between 0.25 to 2.0 mils (see page 7, lines 32-34 of the specification). There is no support for those thicknesses which are between 0.2 and 0.25 mils in the original disclosure. It should be noted that the thickness defined for the arrangements appears to be somewhat a function of the size of the die which is to be attached to the leadframe (in the examples the size was smaller than that of the range defined in the specification).

Additionally, applicant states that "the pressure and the volume selected to form an adhesive layer" both are selected to define together the finished thickness of the adhesive disposed between the chip and the leadframe, however this was NOT described in the original disclosure. Rather as described on page 7, lines 27-34, the original disclosure appears to suggest that the total volume of adhesive applied dictated the thickness of the final adhesive layer and there is no mention of the pressure application controlling the thickness of the adhesive in the finished assembly.

Regarding claim 20, the applicant is advised that the only support for the adhesive force necessary to separate the chip from the leadframe is found in the examples where a specific chip size and a specific thickness (0.2 mil) was defined in the finished assembly. Applicant does not have support for this strength over the broad range for the thickness, volume of adhesive and pressures as defined but rather only has support found in the specific parameters of the examples.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 4, 11, 12-20, 22, 42-44 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In each of the identified claims (or the claims from which they directly depend) the applicant has defined that the pressure applied to the assembly was 75 to 100 grams. Applicant is advised that this is not the correct unit for pressure wherein pressure is measured in grams per unit area. It is suggested applicant define the

specific pressure in terms of grams per unit area so that an accurate evaluation in comparison with the prior art can be made.

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 1-20 and 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Krall in view of Chorbadijiev et al, the admitted prior art, either one of Zwick (newly cited) or PCT WO 97/06953 (newly cited) and either one of Loctite 410 or Loctite 416 optionally further taken with the state of the prior art as exemplified by at least one of Liang et al, Fogal et al, Farnworth, Davis and German Patent 4107347 for the same reasons as expressed in the Office action dated 7-26-04.

Applicant is referred to paragraph 2 of the Office action dated 7-26-04 for a complete discussion of the references to Krall , Chorbadijiev et al, the admitted prior art, Loctite 410, Loctite 416 and the state of the prior art as exemplified by at least one of Liang et al, Fogal et al, Farnworth, Davis and German Patent 4107347. the applicant has amended the claims to define the thickness of the final adhesive layer which is present as well as the volume of adhesive applied and the pressure associated with the pressing of the die to the leadframe in the attaching operation. It is admitted that the prior art as defined in these references failed to expressly define a thickness of the adhesive layer in the finished assembly. The applicant is advised that one skilled in the art would have understood that the conventional die assembly devices of the admitted

Art Unit: 1733

prior art would have applied pressure to the assembly of the chip and leadframe during assembly.

The references to either one of Zwick or PCT '953 suggested that those skilled in the art at the time the invention was made would have understood that for a chip having a size of 5mm by 5mm that the typical thickness of the adhesive after polymerization of the same was 25 microns (or 0.984 mils) wherein the chip was assembled to the leadframe with liquid adhesive droplets and wherein the chip was pressed against the leadframe in the bonding operation, see column 1, lines 23-28 of Zwick and page 1, lines 20-25 of PCT '953. It is clear that one skilled in the art would have desired for a chip size (surface area) of 25 mm^2 (5mm by 5mm) to have an adhesive layer of a thickness of 0.984 mils. The chip size applicant uses in the specification is 4.4 mm by 9.4 mm (or an area of 41.36 mm^2). One would have expected that the volume of adhesive utilized to achieve the thickness of the adhesive for a chip having a surface area of 64% of the surface area of the disclosed chip (i.e. 25 mm^2 is 64% of the size of the chip surface area disclosed) would have fallen within the claimed range as an increased amount would have been applied to obtain the needed coverage for the assembly to provide a spacing of 25 microns for the thickness of the adhesive layer.

Additionally, applicant is advised that as the value for the thickness fell within the middle of the range, one would have expected that the amount utilized for the volume of adhesive would have been within the middle of the recited range. Had one reduced this amount by 36% it still would have fallen within the range of weight of material applied to secure the chip upon the leadframe. Applicant is advised that the references to both of

Art Unit: 1733

Zwick and PCT '953 suggested that those versed in the art would have applied pressure to the assembly when attaching the chip to the leadframe wherein the pressure applied was uniform over the entire surface. The applicant is advised that one skilled in the art would have applied the pressure necessary to obtain an adequate bond and good surface contact (as well as spreading of the adhesive material therein). The applicant is advised that one skilled in the art would have known to apply a pressure within the specified range in order to achieve the desired bond and that the claimed range of pressure is taken as conventional in the art of joining a die to a leadframe. As noted above the specific pressure applied is not clearly recited as pressure must be identified as a force per unit area and no area has been identified. As such, the reference by applying force to assemble the components must teach the specified force.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a cyanoacrylate adhesive to join leads of a leadframe to a semiconductor chip as such was suggested by Krall wherein the cyanoacrylate adhesive would have been known to have incorporated an electrically conductive filler therein in order to facilitate electrical conductivity whereby such an adhesive had a quick cure time as evidenced by Chorbadjiev et al and wherein the adhesive was known to have had a cure time within less than one minute at room temperature as suggested by the applicant's admitted prior art and either one of Loctite 410 or Loctite 416 wherein the processing for attach the die to the leadframe utilized commercially available and conventional components for facilitating the automated placement of the die to the leadframe as admitted were known by applicant's admitted prior art wherein one applied

Art Unit: 1733

pressure and drops of the adhesive in such a manner to yield an adhesive thickness in the finished assembly between 0.2 to 2.0 mils in thickness as suggested by either one of PCT WO 97/06953 or Zwick..

It should be noted regarding the specified strength (peel force) of the bond that one skilled in the art would have expected the same in light of the fact that the prior art of record suggested that one employ the same adhesive materials and that the adhesives were applied to have the same thickness as recited.

Krall suggested that cyanoacrylate adhesive would have been useful for joining a chip to a lead in the manufacture of a semiconductor package. The reference did not expressly state that the chip was assembled to the leadframe but rather referred to the chip being attached to the leads with adhesive. It should be noted that the reference clearly did not refer to "wire bonding" as addressed by applicant in the response. The reference was silent as to what was meant by chip to lead attachment. The applicant is advised that one skilled in the art would have been expected to have basic knowledge of the art and one skilled in the art would have been expected to use common sense and common knowledge from the art, In re Bozek, 163 USPQ 545. The ordinary artisan is presumed to know more than what he reads in the references, he is presumed to have sufficient basic knowledge to apply and combine features of the prior art, In re Sovish, 226 USPQ 771, In re Bode, 191 USPQ 12.

The references to any one of Liang et al, Fogal et al, Farnworth, Davis, and German Patent 4107347 all suggested that one skilled in the art would have known that "wire bonding" was associating a wire between the chip and the leads and that the wire

bonding operation did not include the use of adhesive to join the wire to the chip and the lead. Applicant is referred to the drawings of each document. Additionally, each reference suggested that one skilled in the art would have incorporated an adhesive like an epoxy between the chip and/or die and the leadframe at the paddle of the leadframe. In each of these references, this is where the chip and the lead frame interface is taught and where the same is joined with adhesive. The applicant is also referred to the admitted prior art of this application, where the applicant admitted that it was known to join a chip to a leadframe with epoxy adhesive for example, see pages 2-3 of the specification and note that the admitted prior art also suggested that "wire bonding" was in fact a separate and distinct operation from the adhesive bonding operation. Clearly, one viewing the state of the prior art as exemplified by at least one of Liang et al, Fogal et al, Farnworth, Davis, and German Patent 4107347. Certainly, then, when one skilled in the art viewed Krall, one skilled in the art would have understood that the operation where adhesive was used would have included the joining of the chip to the paddle of the leadframe (since this is the place where the chip is associated with adhesive in the operation of associating a chip to a lead) with the cyanoacrylate adhesive.

7. Claims 21, 22, 40, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art in view of either one of PCT wo/06953 (newly cited) or Zwick.(newly cited) and Japanese Patent 58-196,280

The references to the admitted prior art and Japanese Patent '280 are cited for the same reasons as expressed in paragraph 3 of the Office action dated 7-26-04. the references failed to teach that one skilled in the art would have provided the specific

Art Unit: 1733

volume of adhesive in order to provide a thickness to the finished adhesive layer which was of a thickness between 0.2 and 2.0 mils. The applicant is advised that one skilled in the art would have understood that the conventional die assembly devices of the admitted prior art would have applied pressure to the assembly of the chip and leadframe during assembly.

The references to either one of Zwick or PCT '953 suggested that those skilled in the art at the time the invention was made would have understood that for a chip having a size of 5mm by 5mm that the typical thickness of the adhesive after polymerization of the same was 25 microns (or 0.984 mils) wherein the chip was assembled to the leadframe with liquid adhesive droplets and wherein the chip was pressed against the leadframe in the bonding operation, see column 1, lines 23-28 of Zwick and page 1, lines 20-25 of PCT '953. It is clear that one skilled in the art would have desired for a chip size (surface area) of 25 mm^2 (5mm by 5mm) to have an adhesive layer of a thickness of 0.984 mils. The chip size applicant uses in the specification is 4.4 mm by 9.4 mm (or an area of 41.36 mm^2). One would have expected that the volume of adhesive utilized to achieve the thickness of the adhesive for a chip having a surface area of 64% of the surface area of the disclosed chip (i.e. 25 mm^2 is 64% of the size of the chip surface area disclosed) would have fallen within the claimed range as an increased amount would have been applied to obtain the needed coverage for the assembly to provide a spacing of 25 microns for the thickness of the adhesive layer. Additionally, applicant is advised that as the value for the thickness fell within the middle of the range, one would have expected that the amount utilized for the volume of

Art Unit: 1733

adhesive would have been within the middle of the recited range. Had one reduced this amount by 36% it still would have fallen within the range of weight of material applied to secure the chip upon the leadframe. Applicant is advised that the references to both of Zwick and PCT '953 suggested that those versed in the art would have applied pressure to the assembly when attaching the chip to the leadframe wherein the pressure applied was uniform over the entire surface. The applicant is advised that one skilled in the art would have applied the pressure necessary to obtain an adequate bond and good surface contact (as well as spreading of the adhesive material therein). The applicant is advised that one skilled in the art would have known to apply a pressure within the specified range in order to achieve the desired bond and that the claimed range of pressure is taken as conventional in the art of joining a die to a leadframe. As noted above the specific pressure applied is not clearly recited as pressure must be identified as a force per unit area and no area has been identified. As such, the reference by applying force to assemble the components must teach the specified force. It would have been obvious to employ the quick curing adhesives of Japanese Patent '280 in the operation of joining a chip to a leadframe as such use of anaerobic adhesives would have sped up productivity where the processing included the use of conventional die attachment operations such as those admitted by applicant's admitted prior art wherein the adhesive would have been applied in an amount such that the final thickness of the adhesive was between 0.2 and 2.0 mils in thickness as suggested by either one of Zwick or PCT WO 97/06953 .

Response to Arguments

8. Applicant's arguments with respect to claims 1-22 and 40-44 have been considered but are moot in view of the new ground(s) of rejection.

The applicant essentially argues that the prior art of record failed to teach the specific thickness for the applied layer of adhesive in the finished assembly (which applicant indicated was a function of the volume of adhesive applied and the pressure applied to the assembly). It should be noted that the pressure applied appears to have little to do with the final thickness as such was not in applicant's possession at the time the application was filed. Additionally, the references to Zwick or PCT '953 suggested that one skilled in the art at the time the invention was made would have known to provide the specified thickness for the adhesive layer and that such was conventional in the art in the known and admitted process of joining the die to the leadframe with conventional equipment.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kennedy (column 3, lines 45-50) and Schroeder (column 9, lines 9-11) suggested the specified pressures for joining a chip onto a leadframe.

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

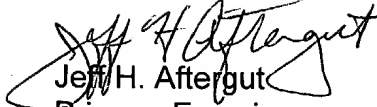
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeff H. Aftergut whose telephone number is 571-272-1212. The examiner can normally be reached on Monday-Friday 7:15-345 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Blaine Copenheaver can be reached on 571-272-1156. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Application/Control Number: 08/916,629
Art Unit: 1733

Page 13


Jeff H. Aftergut
Primary Examiner
Art Unit 1733

JHA
December 1, 2004
